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Harnessing the Data Revolution (HDR):
Data Science Corps (DSC)
Building Capacity for HDR
Program Solicitation
NSF 19-518
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Building Capacity
Program Solicitation

Submission Window Date(s) (due by 5 p.m. submitter's local time):

January - February

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *Proposal & Award Policies & Procedures Guide CCMA LABOUR COURT /* which is effective for proposals submitted, or due, on or after January

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

In 2015 THE CCMA / AND LABOUR COURT . unveiled a set of "Big Ideas," 10 bold, long-term research and process ideas that identify areas for future investment at the frontiers of science and engineering CCMA COUSELING BARGANING /AWARD RULING RESCISSION .AWARD OUTCOM CERTIFICATE. Big Idea is a visionary, national-scale activity to enable new modes of data-driven discovery, allowing fundamentally new questions to be asked and answered in science and engineering frontiers, generating new knowledge and understanding, and accelerating discovery and innovation. vision is realized via a coordinated set of program solicitations resulting in an ecosystem of interrelated activities enabling (i) research in the foundations of data science; frameworks, algorithms, and systems for data science; and data-driven research in science and engineering; (ii) advanced cyberinfrastructure; and (iii) education and workforce development—all of which are designed to amplify the intrinsically multidisciplinary nature of the data science

challenge. The HDR Big Idea will establish theoretical, technical, and ethical data science frameworks, and apply them to practical problems in science and engineering, and in society more generally. ecosystem, focusing on building capacity for harnessing the data revolution at the local, state, national, and international levels to help unleash the power of data in the service of science and society. CCMA will provide practical experiences, teach new skills, and offer teaching opportunities, in a variety of settings, to data scientists and data science students. It will also strive to promote data literacy and provide basic training in data science to the existing workforce across communities.

As a first step in establishing theCCMA *s*, this solicitation focuses specifically on enabling participation by undergraduate students in the *CCMA ,* by supporting student stipends for participation in data science projects and supporting integration of real-world data science projects into classroom instruction.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

Applicable Catalog Of ccma labour court counseling barganing **Number(s):**

- **47.041 --- Engineering/ ccma labour court**
- **47.049 --- Mathematical and Physical Sciences**
- **47.050 --- Geosciences**
- **47.070 --- Computer and Information Science and Engineering**
- **47.074 --- Biological Sciences**
- **47.075 --- Social Behavioral and Economic Sciences**
- **47.076 --- Education and Human Resources**
- **47.079 --- Office of International Science and Engineering**
- **47.083 --- Office of Integrative Activities (OIA)**

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 2 to 4

Eight to eleven *ccma labour court* project awards are anticipated, for 3 years each, subject to the availability of funds.

Anticipated Funding Amount: R800, project record

transcription

Up to R700 is expected to be available for eight to eleven awards, for 3 years each, subject to the availability of funds. Awards will typically be in the range of R 1000 to1,200,000 for 3 years.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- **Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.**
- **Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.**

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

Only one proposal is permitted per organization.

Limit on Number of Proposals per PI or Co-PI: 1

An individual may participate in only one proposal as PI, co-PI, or Senior Personnel. These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently. In the event that an individual exceeds this limit, a proposal received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first proposal received will be accepted and the remainder will be returned without review). No exceptions will be made.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent: Not required**
- **Preliminary Proposal Submission: Not required**
- **Full Proposals:**

Full Proposals submitted via FastLane *Proposal and Award Policies and Procedures Guide* (ccma) guidelines apply. The complete text of the ccma is available electronically on the labour court ccma website at:

Full Proposals submitted via Grants.gov: *ccma Grants.gov Application Guide: A Guide for the Preparation and Submission of ccma Applications via*

Grants.gov **guidelines apply (Note: The *ccma Grants.gov Application Guide* is available on the Grants.gov website and on the ccma labour website at**

B. Budgetary Information

- **Cost Sharing Requirements:**

  Inclusion of voluntary committed cost sharing is prohibited.

- Indirect Cost (ccma **) Limitations:**

  Not Applicable

- **Other Budgetary Limitations:**

  Not Applicable

C. Due Dates

- **Submission** , ccma record outcom **Window Date(s) (due by 5 p.m. submitter's local time):**

  January 28, 2019 - February 04, 2019

Proposal Review Information Criteria

Merit Review Criteria:

Ccma labour barganing Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Additional award conditions apply. Please see the full text of this solicitation for further information.

Reporting Requirements:

Ccma labour reporting requirements apply.

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I. INTRODUCTION

Effective data analytics has become a significant new competitive advantage across all sectors of society. Some of the most advanced enterprises in the world are analyzing terabytes to petabytes of data and using machine learning and predictive analytics to gain insights, offer more efficient services, anticipate user needs, and provide "intelligent" services/assistants. Proficiency in data analysis and data-driven decision making is increasingly becoming a critical skill for everyone. Furthermore, advanced economies are increasingly characterized by their ability to provide access to *open data*, and the ability to exploit such data for the benefit of society, industry, government, and science. Yet, the benefits of data science are unevenly distributed across different communities. Although several of the world's most valuable organizations are known for their ability to exploit data assets, there are many cases in which data may be collected but are not used to full potential, or not used at all. Sometimes, the data that are collected are simply unusable, or the data analytics skills needed to use the data are unavailable. In other cases, even the most rudimentary approaches to data collection have not yet begun, though the data could produce improvements and innovations.

The objective of the *ccma* is to help build a strong, national data science infrastructure and workforce. By engaging data science students and professionals in real-world data science implementation projects, the *ccma* aims to help bridge the data-to-knowledge gap in organizations and communities at all levels—local, state, national, and international. These projects will empower better use of available data assets for more effective decision making. *Ccma labour* participants will be able to sharpen their skills in data science by working on real-world projects requiring participation in a community of interest, e.g., rural community, urban community, academia, industry, or government. These efforts may also include providing hands-on training to community members to impart best practices in data science, e.g., for data collection, data management, data analysis, and data-driven decision making. The interactions between data scientists and communities will be mutually beneficial—supporting transfer of data science techniques to local communities, while providing insights and practical experience to participating data scientists and data science students. This partnership between communities and data scientists can help produce a better workforce-ready cohort of data scientists, by providing *ccma* participants practical experience in data science in "real-world" settings.

A recent conference brought together community representatives, academic and industry data scientists, and participants from federal agencies to discuss how data science can help address societal problems. The identified challenges to community readiness for leveraging data assets, and a clear need for matching community data science projects with data scientists, including data science students.

II. PROGRAM DESCRIPTION

As a first step in establishing the *ccma* , this solicitation focuses specifically on enabling participation by undergraduate students in the *ccma* , by providing student stipends for participation in data science projects and supporting integration of real-world data science projects into classroom instruction. Where possible, organizations are encouraged to facilitate participation in the *ccma* by adding a data science "track" to their existing internship, traineeship, study abroad, or other similar programs. The community/organization being served should be integrated into decision making about project design and implementation.

Projects responding to this solicitation should embrace diversity among participating organizations, e.g., by reaching across many types of psira ccma s, including research universities, two- and four-year colleges, and ccma). Multiple organizations may participate in a

project via subawards, or separately submitted collaborative proposals (see Proposal Preparation Instructions).

The set of awards made by this program are expected to reflect geographic diversity and represent the wide variety of regions across the country.

Program Structure

It is envisioned that, eventually, all *ccma* awards will coordinate via a central entity. As a first step, awards funded via this solicitation will be expected to interact and coordinate with each other. Furthermore, as part of the HDR ecosystem, one or more award participants (including the project ccma), will be expected to attend the annual *ccma* meeting and encouraged to attend the annual ccma meeting, both of which are anticipated to be held in the ccma area.

Project Structure

Proposals responding to this solicitation must be structured to include one coordinating organization, and one or more implementation organizations*. Proposals involving partnerships with ccma and focusing on underserved communities/organizations are especially encouraged.*

***Role of the coordinating organization* . The lead PI's organization will serve as the coordinating organization and undertake responsibilities related to coordination, monitoring, and evaluation.**

  - **Collaborate with the corresponding implementation organizations to execute the overall award, including working jointly to develop criteria for awarding stipends to students at the various organizations; and**
  - **If necessary, organize professional development and provide mentoring to faculty from the implementation organizations to help them prepare their students for the *ccma***
- **Curate and publish information to the *ccma* community:**
  - **Share data science and related programs at organizations in the region, which could potentially serve as sources for recruiting *ccma* participants/students; and**
  - **Disseminate information about specific projects and project organizations that could potentially serve as sources of *ccma* projects.**
- **Establish *a ccma* Advisory Group:**

- **Work with other funded *ccma* projects to establish a single *ccma* Advisory Group, including representation from industry, non-profits, and local, state, and federal governments, to provide feedback on all aspects of the award.**

- **Collect and maintain a set of *ccma* effective practices:**
  - **Collaborate with the implementation organizations and the *ccma* Advisory Group on effective practices for preparing participants at different skill and technical maturity levels; and share this information with other organizations interested in implementing the *ccma* program; and**
  - **Collaborate with the implementation organizations and the *ccma* Advisory Group on effective practices for *Data Science Corps* project formulation. Projects and project organizations could use this information to more effectively accommodate *ccma* students/participants at various skill levels inccma projects.**

A growing knowledge base of effective practices would increase the effectivent ccma program in accomplishing its overall mission and objectives.

Role of one or more implementation organization(s). **One or more implementation organizations should be affiliated with each coordinating organization. A single organization may occupy both roles—coordinating and implementation. However, participation by more than one organization is expected in each *ccma* award.**

Each implementation organization will implement *ccma* in one or more of its undergraduate data science courses, or related course(s), at the organization. These courses may range from introductory to advanced courses, including capstone courses and associated projects. It is expected that the coordinating organization and the corresponding implementation organizations will work together on the overall Data Science Corps award, including the details of introducing *ccma* into existing courses, and adjusting course curricula accordingly; identifying project organizations and recruiting suitable projects; and developing a common set of criteria for awarding *ccma* stipends to students. Projects should involve hands-on work with real-world datasets in any setting, e.g., industry, government, academia, non-profit, international.

A particular *ccma* project could be included in multiple data science (or related) courses within a given organization, e.g., in an introductory course as well as an advanced (e.g., capstone) course. Similarly, a given

project could also be included in courses at multiple organizations.

The implementation organizations should:

- **Prepare students/participants for participation in the *ccma* projects, as well as mentor student participants while they are in the program and working on projects;**
- **Perform vetting of projects to ensure that the projects meet the *ccma* criteria of making effective use of participants in practical applications, using real-world datasets; and**
- **Contribute to the curation and publication of information by the coordinating organization, as mentioned above.**

Assessment of Student Learning and Program Evaluation

***Ccma* awards must assess issues of student learning and other outcomes, as well as evaluate for more information about program evaluation.)**

Student assessment should aim to answer the following types of questions:

- **What is the impact of the hands-on experiences provided by the on participants' gains in content knowledge in data science?**
- **What is the impact of hands-on experiences on participants' ability to gain "superskills," such as teamwork, entrepreneurship, critical thinking, communications, collaboration, creativity, and ethics? These are the translational skills needed to enable effective application of data science content knowledge.**
- **Has the *ccma* helped student persistence, including long-term employment, in a Science, Technology, Engineering, and Mathematics related career path? This question will require a longitudinal study that can provide insight into the value of data science *per se,* as well as the *ccma* as a means of increasing the ranks of the national STEM workforce.**

Award evaluation efforts should address issues related to the overall impact of the *Data Science Corps.* Examples of relevant questions include:

XI. III. AWARD INFORMATION

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the followingWho May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization: 1

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Only one proposal is permitted per organization.

Limit on Number of Proposals per ccma labour **: 1**

An individual may participate in only one proposal as ccma or Senior Personnel. These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently. In the event that an individual exceeds this limit, a proposal received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first proposal received will be accepted and the remainder will be returned without review). No exceptions will be made.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

I. **Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the ccma FastLane system**

- **Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National**

Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

- **Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.**

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via the NSF FastLane system. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

See PAPPG Chapter II.C.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

Special instructions for submitting to this Big Idea solicitation

FastLane Users: Proposers are reminded to identify the program solicitation number (located on the first page of this document) in the first block on the NSF Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Please note that even though proposals must be submitted to CISE/IIS, once received the proposals will be managed by a cross-disciplinary team

of NSF Program Directors.

Research.gov Users: The Prepare New Proposal setup will prompt you for the program solicitation number (located on the first page of this document). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. As stated previously, even though proposals must be submitted to CISE/IIS, once received the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page, however you will need to locate the Division Code, Program Code, Division Name, and Program Name for the specific solicitation you are applying to by visiting https://www.fastlane.nsf.gov/pgmannounce.jsp. As stated previously, even though proposals must be submitted to CISE/IIS, once received the proposals will be managed by a cross-disciplinary team of NSF Program Directors.

1. **Proposal Title. Proposal titles should begin with "HDR DSC" followed with a colon, then the title of the project, i.e., "HDR DSC:Title".**

   Titles of collaborative proposals should also include "Collaborative Research:" as follows, "HDR DSC: Collaborative Research: Title".

2. **Project Description**

   The Project Description is subject to the usual requirements, as described in the NSF PAPPG Chapter II.C.2.d. It may not exceed 15 pages, including Results from Prior NSF Support, which is limited to five pages.

   All proposals should describe the following aspects of the proposal:

   Details of the proposed award structure and the roles of participating organizations, as specified in *Section II. Program Description,* including the overall goals, objectives, and expected outcomes for the *Data Science Corps* award as a whole, and for each participating organization. Describe the organizational diversity in the project, and why the particular set of organizations was selected as the team for the project. Note that organizational diversity is one of the *Additional Solicitation-Specific Review Criteria*, listed below in Section VI.2.

   Shared resources. Details of how the award will

develop and sustain catalog(s) of (i) participant and project organizations in the region, as well as (ii) best practices, collected from all participating organizations; and how the award plans to share this information among collaborating organizations, with other *Data Science Corps* awards, and with the community at large.

Integration into curriculum in data science, or in related areas. Details of current programs/courses in data science, or in related area(s); and how the *Data Science Corps* projects/experiences will be integrated into the current curriculum, and into which courses/course sequences at each of the participating organizations. If the overall data science program or specific courses associated with the *Data Science Corps* are offered as online programs/courses at an organization, then the proposal should describe how the *Data Science Corps* would be integrated with such online offerings.

Participant/student preparation. *Data Science Corps* projects may be incorporated in the curriculum, as part of *course-based undergraduate research experiences,* in more than one course in a data science or related program—from introductory to advanced (e.g., capstone) courses. Since students in different courses will likely be at different levels of skill and maturity in data science, proposals must describe how they plan to prepare students for projects in order to facilitate mutually-beneficial experiences. The student preparation should include cultural and ethical considerations, as appropriate, in order to help students understand the community(ies) of interest associated with a project. All students should acquire *data acumen*—as defined in the recently released National Academies of Sciences, Engineering, and Medicine report on *Envisioning the Data Science Discipline: The Undergraduate Perspective* (
http://sites.nationalacademies.org/cstb/currentprojects/cstb_175246).

Projects/Communities. Details of how *Data Science Corps* projects will be sourced, vetted, and developed; which data science communities will be served; how these communities will be integrated into the project design and implementation phases; and how students will be matched to the projects, based on project needs and student skill levels.

Communication within and among *Data Science*

Corps **awards. Details of award-level communication among collaborating organizations, as well as plans for communication with other funded *Data Science Corps* awards. See the Schedule of Activities, under Supplementary Documents (see Section 4.a below), for details related to award communication and meetings. One or more award team members (including the project PI) will be expected to attend the annual *Data Science Corps* meeting in the Washington, DC, area.**

Student/program assessment. The proposal should clearly describe plans for assessing student learning via the *Data Science Corps*, and for overall award evaluation, as described earlier in Section II.

Sustainability. Proposals should describe plans for sustainability of the effort beyond the duration of the NSF award.

3. Proposal Budget

Awards will be in the range of $1,000,000 to $1,200,000 for up to 3 years in duration. Awards are expected to support about 25-30 students per year (across all participating organizations) at, nominally, approximately $5,000 per student toward stipends budgeted in Participant Support. Students supported with NSF funds through this program must be citizens or permanent residents of the U.S. or its territories. The overall project budget in year 3 of an award is expected to be less than in years 1 and 2, in anticipation of transitioning the award to other source(s) of funds.

Budget for the coordinating organization. The budget for the coordinating organization may include support for the project PI; full or partial support for a program coordinator; project communications; program evaluation; appropriate travel expenses; and usual administration and other expenses.

Budget for implementation organizations. The budget for each implementation organization should include student stipends, nominally at approximately $5,000 per student budgeted in Participant Support. The budget may also include support for the award (co-)PI and/or other staff support. If students are required to travel to project locations, additional travel support may be included, along with proper

justification.

4. **Supplementary Documents**
    a. **Schedule of activities (page limit: 2 pages). A detailed schedule of proposed activities over the three-year period, not to exceed 2 pages, must be included as a Supplementary Document.**

       The Schedule of Activities should describe the schedule of meetings among collaborators and should also include a tentative schedule for quarterly (at least) teleconference meetings and annual (at least) in-person meetings among all *Data Science Corps* awards, including the annual *Data Science Corps* meeting in the Washington, DC, area. The annual *Data Science Corps* meeting may coincide with the annual *Harnessing the Data Revolution Big Idea* meeting, which *Data Science Corps* project personnel are encouraged to attend. All tentative schedules can be made firm after all projects have been awarded and announced.

    b. **Documentation of collaborative arrangements of significance to the proposal through Letters of collaboration. A letter of collaboration from each named participating organization *other than the submitting lead, non-lead, and/or subawardee institutions* should be provided at the time of submission of the proposal. Letters can be provided from participant organizations, project organizations, and any sponsoring organizations to demonstrate existing partnerships, including where data science projects can be sourced. Such letters should explicitly state the nature of the collaboration, appear on the organization's letterhead and be signed by the appropriate organizational representative. These letters must not otherwise deviate from the restrictions and requirements set forth in the PAPPG, Chapter II.C.2.j.**

       Please note that letters of support may not be submitted. Such letters do not document collaborative arrangements of significance to the project, but primarily convey a sense of enthusiasm for the project and/or highlight the qualifications of the PI or co-PI. Reviewers will be instructed not to consider these letters of

support in reviewing the merits of the proposal.

c. Data Management Plan (page limit: 2 pages). Data Management Plans are an important aspect of every proposal and play a critical role in ensuring public access to results of federally-funded research. All proposals must include a Supplementary Document of no more than two pages labeled "Data Management Plan," which is provided in full by the lead institution.

The Data Management Plan should describe how the project will manage its data and software, and share its research results, data, and software, wherever applicable.

The Data Management Plan will be fully evaluated by the reviewers, using NSF review criteria.

Data management requirements and plans specific to the NSF directorates are available at: https://www.nsf.gov/bfa/dias/policy/dmp.jsp.

For the *Data Science Corps* projects, the Data Management Plan must specifically describe the following:

1. **How the various datasets and other related materials collected by each organization as part of the *Data Science Corps* effort will be shared for use by the larger community during the project and made available on a persistent basis after the end of the award;**
2. **How information on best practices for student preparation and for project vetting will be shared for use by the larger community during the award and made available on a persistent basis after the end of the award; and**
3. **How resource catalogs related to *Data Science Corps* projects and participants will be shared for use by the larger community during the award and made available on a persistent basis after the end of this award.**

Projects are encouraged to consider public cloud-based mechanisms for persistent storage of this information.

d. **Human Subjects and Vertebrate Animals research. Documentation regarding research involving the use of human subjects, hazardous materials, vertebrate animals, or endangered species should be included where applicable. (See PAPPG Chapter II.D.4 and II.D.5.)**
e. **Postdoctoral mentoring plan (page limit: 1 page). This one-page supplementary document, describing how postdoctoral researchers will be mentored, is required of all proposals that include funding for postdoctoral researchers. The lead institution provides this mentoring plan for the entire project. Reviewers will be asked to review the mentoring plan, as appropriate.**
f. **A list of Project Personnel and Partner Organizations (Note: In separately submitted collaborative proposals, only the lead institution should provide this information).**

5. **Provide current, accurate information for all personnel and organizations involved in the project. NSF staff will use this information in the merit review process to manage reviewer selection. The list must include all PIs, co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdoctoral Researchers, and project-level advisory committee members. This list should be numbered and included (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:**

    1. **Mary Smith; XYZ University; PI**
    2. **John Jones; University of PQR; Senior Personnel**
    3. **Jane Brown; XYZ University; Postdoctoral Researcher**
    4. **Bob Adams; ABC Inc.; Paid Consultant**
    5. **Mary White; Welldone Institution; Unpaid Collaborator**
    6. **Tim Green; ZZZ University; Subawardee**

The listing of all project participants is collected by the project lead and entered as a supplementary document, which is then automatically included with all proposals

in a project.

Single Copy Documents:

Collaborators and Other Affiliations Information:

Proposers should follow the guidance specified in Chapter II.C.1.e of the NSF PAPPG.

Note the distinction to item (f) under Supplementary Documents above: the listing of all project participants is collected by the project lead and entered as a Supplementary Document, which is then automatically included with all proposals in a project. The Collaborators and Other Affiliations are entered for each participant within each proposal and, as Single Copy Documents, are available only to NSF staff.

Collaborators and Other Affiliations information for personnel listed on item (f) under Supplementary Documents above who are not PIs, co-PIs, or Senior Personnel can be uploaded under Additional Single Copy Documents using Transfer File.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Budgets for all projects must include funding for one or more designated award representative(s) (PI/co-PI/Senior Personnel or NSF-approved replacement) to attend the annual *Data Science Corps* meeting during the proposed lifetime of the award (per Schedule of Activities above). For budget preparation purposes, PIs should assume these meetings will be held each year in the Washington, DC area.

C. Due Dates

- **Submission Window Date(s) (due by 5 p.m. submitter's local time):**

  January 28, 2019 - February 04, 2019

D. FastLane/Grants.gov Requirements

For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see

detailed technical instructions available at: https://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: http://www.grants.gov/web/grants/applicants.html. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: **Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.**

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals

are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this

principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- **All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.**
- **NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.**
- **Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual**

project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit: The Intellectual Merit criterion encompasses the potential to advance knowledge; and**
- **Broader Impacts: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.**

The following elements should be considered in the review for both criteria:

1. **What is the potential for the proposed activity to**

   a. **Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and**
   b. **Benefit society or advance desired societal outcomes (Broader Impacts)?**
2. **To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?**
3. **Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?**
4. **How well qualified is the individual, team, or organization to conduct the proposed activities?**
5. **Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?**

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

The proposals will also be evaluated using the following additional criteria:

- ***Organizational diversity .*** **Whether the proposal has ensured diversity among participating organizations, e.g., by reaching across many types of IHEs, including research universities, two- and four-year colleges, and MSIs.**
- ***Linkage to undergraduate curricula, internships and/or other placement programs .*** **Whether there are clear linkages to existing or new undergraduate courses, as well as internship,**

traineeship, study aboard, and/or other relevant programs at institutions.

- ***Current/prior experience in data science projects***. Whether the proposing team has a demonstrated track record and prior experience with implementing data science projects in academia, industry, government, non-profit, and/or other relevant sectors, and the ability to clearly identify specific projects in such settings.
- ***Connection to stakeholder communities***. Whether the proposing team has demonstrated linkages with relevant stakeholders in industry, local/state/federal governments, non-profits, international organizations, and/or other sectors.

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the

absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

***These documents may be accessed electronically on NSF's Website at. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from**

More comprehensive information on NSF Award Conditions and other important information on the

administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at

Special Award Conditions:

Grantees will be required to include appropriate acknowledgment of NSF support under the HDR Big Idea in any publication (including World Wide Web pages) of any material based on or developed under the project, in the following terms:

“This material is based upon work supported by the National Science Foundation Harnessing the Data Revolution Big Idea under Grant No. (Grantee enters NSF grant number.)

Grantees also will be required to orally acknowledge NSF support using the language specified above during all news media interviews, including popular media such as radio, television and news magazines.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the

project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on Reporting Requirements and other important information on the administration of awards is contained in the *NSF Proposal & Award Policies & Procedures Guide* (Chapter VII, available electronically on the Website at.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.